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Nebraska Beef Cattle Reports

Animal Science Department

2020

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Summary with Implications

An incomplete 2×4 factorial finishing study evaluated the effect of corn hybrid fed as dry-rolled corn, and inclusion level of wet distillers grains plus solubles on finishing performance of yearling steers. The two hybrids included a conventional commercial corn and Syngenta's Enogen Feed Corn which contains an alpha amylase enzyme trait. Diets contained 0, 15, 30, or 45% with Syngenta Enogen Feed Corn and 0 or 30% wet distillers grains plus solubles in control corn diets. Increasing wet distillers grains plus solubles with Syngenta Enogen Feed Corn linearly increased hot carcass weight, dry matter intake, and average daily gain, while improving feed conversion. When comparing cattle fed Syngenta Enogen Feed Corn to control with 0 or 30% wet distillers grains plus solubles, no significant differences were observed for any of the performance characteristics. Nonetheless, steers fed Syngenta Enogen Feed Corn with 0% wet distillers grains plus solubles had 3% numerically better feed conversion, but was similar to control when 30% wet distillers grains plus solubles were fed.

Introduction

Traditionally, feed efficiency and starch digestion in beef cattle have been increased via corn processing methods (rolling, ensiling, steam flaking, etc.). However, increased corn processing also results in an increased risk of acidosis, as more rapidly fermentable grains enter the rumen. To maximize animal performance, starch digestion must be enhanced while limiting the risk of digestive upsets. Syngenta Enogen Feed Corn (EFC; Syngenta Seeds, LLC) has been genetically enhanced to contain an α-amylase enzyme trait. This trait may result in improved animal performance by increasing post-ruminal starch digestion. Previous research has observed a decrease in F:G and an increase in post-ruminal starch digestion when EFC was fed as DRC, compared to cattle fed corn not containing the α-amylase enzyme trait (*2018 Nebraska Beef Cattle Report*, pp. 92–94; *2016 Nebraska Beef Cattle Report*, pp. 135–138; *2016 Nebraska Beef Cattle Report*, pp. 143–145). However, this response has been variable across studies.

One question that remains unanswered is how EFC interacts with varying distillers grains inclusions. Increased protein entering the small intestine could enhance post-ruminal starch digestion. The objective of this study was to evaluate EFC when fed with different inclusions of wet distillers grains plus solubles on finishing beef cattle performance.

Table 1. Dietary treatment compositions (DM Basis) for finishing steers fed Syngenta Enhanced Feed Corn or Control hybrids as dry-rolled corn, with titrating levels of WDGS.

Trait	EFC[1]				CON[2]	
WDGS Inclusion:	0[4]	15	30	45	0[4]	30
Control DRC[2]	0	0	0	0	79	49
EFC DRC[1]	79	64	49	34	0	0
WDGS	0	15	30	45	0	30
Corn Silage	15	15	15	15	15	15
Liquid Supplement[3]	6	6	6	6	6	6

[1]EFC = Syngenta Enhanced Feed Corn provided by Syngenta under identity-preserved procedures, stored, and processed as dry-rolled corn (DRC).

[2]Control = Commercially available corn grain without the alpha amylase enzyme trait.

[3]Supplement for all diets formulated to provide 30g/ton Rumensin® (Elanco Animal Health, DM Basis), 8.8g/ton Tylan® (Elanco Animal Health, DM Basis).

[4]Supplement for the 0% WDGS diets formulated to provide 4.31% CP (1.5% urea), 0.64% Ca, and ≥ 10,820 IU Vitamin A.

Supplement for the 15% WDGS diet formulated to provide 1.44% CP (0.5% urea), 0.64% Ca, and ≥ 10,820 IU Vitamin A.

Supplement for the 30 and 45% WDGS diets formulated to provide 0.64% Ca, and ≥ 10,820 IU Vitamin A.

Procedure

A 154-d finishing study, utilizing 480 crossbred yearling steers (BW = 829 ± 69 lb) in a randomized block design, was conducted at the Panhandle Research and Extension Center (PHREC) feedlot near Scottsbluff, Nebraska. Steers were limit fed a diet consisting of 50% alfalfa hay and 50% Sweet Bran (Cargill; Blair, NE) at 2.0% BW for five consecutive days to equalize gut fill. Steers were then weighed on two consecutive days and the average was used as initial BW. Steers were blocked by BW into light, medium and heavy BW blocks (n = 2, 4 and 2 replicates respectively) based on d 1 BW, stratified by BW and assigned randomly to 1 of 48 pens, with pens assigned randomly to 1 of 6 treatments. There were 10 steers/pen and 8 replications/treatment. Cattle were implanted with Revalor 200® (Merck Animal Health) on d 35 of the trial.

Dietary treatments (Table 1) were arranged in an incomplete 2 × 4 factorial, and included 1) Syngenta Enogen Feed Corn processed as DRC with 0% WDGS (EFC 0), 2) EFC with 15% WDGS (EFC 15), 3) EFC with 30% WDGS (EFC 30), 4) EFC with 45% WDGS (EFC 45), 5) conventional commercial corn processed as DRC with 0% WDGS (CON 0), and 6) CON with 30% WDGS (CON 30). Steers were adapted over a 21-d step-up period, with WDGS and corn silage inclusions held constant, while DRC replaced alfalfa hay.

Steers were harvested on day 155 at a

Table 2. Effect of corn hybrid and distillers inclusion on cattle performance and carcass characteristics

Hybrid	Treatments[1] EFC[2]				Control[3]		SEM	P-Values Main Effects of DGS		EFC vs. CON[4]	
Distillers Incl.	0	15	30	45	0	30		Linear[5]	Quadratic[6]	0 vs. 0	30 vs. 30
Pens	8	8	8	8	8	8					
Performance											
Initial BW, lb	829	829	829	830	829	829	0.5	0.83	0.24	0.41	0.62
Final BW, lb	1416	1450	1469	1471	1406	1457	10.6	<0.01	0.12	0.49	0.41
DMI, lb/d	25.35	26.11	26.38	26.54	25.68	25.93	0.292	<0.01	0.29	0.40	0.26
ADG, lb[7]	3.81	4.03	4.16	4.16	3.75	4.08	0.068	<0.01	0.11	0.51	0.42
Feed:Gain	6.66	6.48	6.41	6.38	6.87	6.37	-	0.04	0.45	0.17	0.69
Carcass Characteristics											
HCW, lb	892	913	926	926	886	918	6.7	<0.01	0.12	0.51	0.42
LM Area, in	14.7	14.7	14.5	14.3	14.7	14.7	0.175	0.09	0.58	1.00	0.35
Back Fat Thickness, in	0.55	0.63	0.70	0.67	0.52	0.64	0.018	<0.01	<0.01	0.37	0.01
Marbling Score[8]	553	553	541	561	546	556	12.9	0.82	0.42	0.70	0.39

[1]DRC based diets with titrating levels of WDGS inclusions from 0 to 45%, all diets included supplement at 6%.

[2]EFC = Syngenta Enhanced Feed Corn provided by Syngenta under identity-preserved procedures, stored, and processed as dry-rolled corn (DRC).

[3]Control = Commercially available corn grain without the alpha amylase enzyme trait.

[4] Contrast comparison of EFC and Control DRC with 0 and 30% distillers inclusion.

[5] Linear effect of distillers grains inclusion levels on EFC.

[6] Quadratic effect of distillers grains inclusion levels on EFC.

[7]Calculated from hot carcass weight.

[8] Marbling score 400 = Small00, 500 = Modest00

commercial abattoir (Cargill, Fort Morgan, CO). During harvest, hot carcass weight (HCW) was recorded and carcass-adjusted final BW was calculated from a common 63% dressing percentage. Carcass characteristics included marbling score, 12th rib fat thickness, and *Longissimus* muscle (LM) area, which were recorded after a 48-hr chill.

Data were analyzed using the PROC GLIMMIX procedure of SAS (SAS Institute, Inc., Cary, N.C.) as a randomized block design, with pen as the experimental unit and block as a fixed effect. Data were analyzed as a 2×2 factorial, evaluating corn type and WDGS inclusion interaction for CON and EFC with 0 or 30% WDGS. Additionally, linear and quadratic orthogonal contrasts evaluated the impact of replacing EFC DRC with 0, 15, 30, and 45% inclusion of WDGS.

Results

Orthogonal contrasts were used to evaluate the effect of WDGS inclusion when replacing 0, 15, 30, or 45% DRC (Table 2). No effects were observed for initial BW or marbling score ($P \geq 0.24$). A linear effect ($P < 0.01$) was observed for HCW and carcass-adjust final BW, with cattle consuming increased levels of WDGS having greater carcass weights. There was a linear increase in DMI as WDGS inclusion increased from 0 to 45%. Furthermore, ADG linearly increased, with steers gaining more as WDGS inclusions increased in the diet from 0 to 45% ($P < 0.01$). Due to increased DMI and ADG, cattle consuming increased inclusions of WDGS had a linearly decrease in F:G ($P = 0.04$). A tendency for a linear decrease in LM area was observed ($P = 0.09$). A quadratic effect was observed for back fat thickness. Cattle consuming increased levels of WDGS had greater back fat, with steers on 0% WDGS having the least amount and those on 30% WDGS having the greatest fat thickness ($P < 0.01$).

Contrasts were used to evaluate the effect of hybrid type and WDGS inclusion for the 0% and 30% inclusion diets. No significant differences were observed for any of the performance parameters or carcass characteristics evaluated when comparing cattle fed EFC with those fed CON with 0% WDGS ($P \geq 0.17$). However, cattle fed EFC with 0% WDGS had numerically greater ADG and lower F:G compared to those on the CON 0% diet ($P = 0.17$). The improvement in F:G was 3% for the diet suggesting the corn was 4% better for feed efficiency (3/0.79). This numerical response has been consistent across numerous experiments.

Furthermore, no significant differences were observed for any of the performance parameters evaluated when comparing steers consuming the EFC hybrid with those fed the CON hybrid with 30% WDGS ($P \geq 0.26$). Fat thickness was greater for cattle consuming EFC compared to those on the CON diet, when WDGS was included at 30% (0.70 and 0.64 respectively; $P = 0.01$).

Conclusion

Feeding finishing beef cattle increasing inclusions of WDGS linearly increased HCW, DMI, ADG, and feed efficiency in diets containing EFC hybrid corn. Furthermore, an increase in WDGS inclusion resulted in a quadratic increase in back fat thickness in steers fed EFC based diets. When comparing the effect of hybrid, no statistical differences were observed among cattle consuming diets with 0% WDGS, despite the observation of a 3% numerical improvement in feed conversion. No performance changes were observed between EFC and CON when diets contained 30% WDGS.

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